Turn-of-the-Month Effect

A study of the existence of a calendar effect on the Swedish stock market

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Stockholm Business School
Bachelor’s Degree Thesis 15 HE Credits
Subject: Business Administration
Field: Finance
Spring semester 2022
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Acknowledgments

We would like to express our sincere gratitude to our supervisor, Lars Nordén, for guiding us throughout the entire thesis. The assistance provided by our supervisor is deeply appreciated. We would further express our gratitude to our professors in previous courses for providing us with the knowledge required for this thesis. We are also grateful to Arsham Afshari for the insightful advice and support offered in making this study possible.

We would further want to thank our peer students, Simon Blank, Samuel Höög, and Lemar Jalili for their valuable comments given through the thesis. Lastly, we wish to acknowledge the finance department at Stockholm Business School for providing us with the aid required to finalize this research.

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Abstract

This thesis investigates the existence of the turn-of-the-month (ToM) effect on the Swedish stock market and further examines whether this calendar anomaly is persistent but different during the Covid-19 pandemic. The main purpose of this study is to determine if the ToM effect is significant in the Swedish stock market over twelve years, particularly during the Covid-19 pandemic. The major finding is that the ToM effect is statistically significant for all indexes except for the large cap. The ToM window for the mid- and all cap indexes is significant for the last four trading days of the month to the first trading day of the next month. It is also significant for the small cap index during the last four trading days of the month to the first two trading days of the next month. The results of a significant ToM effect are similar to those of prior research, except that the Swedish stock market has an earlier ToM window. The Covid-19 pandemic is divided into three windows – before the virus has reached Sweden, before vaccinations, and after vaccinations. The results indicate that the ToM effect is insignificant when Covid-19 had not yet reached Sweden. Additionally, this study discovers a significant ToM pattern in the small cap and mid cap indexes, but not for the large cap or all cap indexes before vaccinations and after vaccinations. Hence, the ToM effect is persistent but different during a time of a major crisis, which in this paper is the time of the Covid-19 pandemic.

The research approach is deductive and quantitative. All data is collected from Nasdaq as observations of the daily adjusted closing prices starting from 1/4/2010 to 4/22/2022, and consists of the indexes: *OMXSCAPGI*, *OMXS30GI*, *OMXSSCGI*, and *OMXSMCGI*. The daily returns are then regressed on dummy variables for the trading days, by using different ToM windows to find results if these ToM windows are significant or not.

Keywords

Calendar anomaly, Turn-of-the-month (ToM) effect, Covid-19 pandemic

Table of Contents

1.0 Introduction

1.1 Background

The efficient market hypothesis (EMH) indicates that an investor's strategy cannot outperform the market. The EMH assumes that stocks are constantly traded at their fair values (Fama, 1970) and the research in the field of existing calendar anomalies confronts this assumption. Calendar anomalies are seasonality effects in the financial markets causing inefficiency in the market. As a consequence of markets setting the prices, market inefficiency leads the investors to opportunities for making profits due to mispricing in the stocks (Singal, 2003). EMH assumption of *structural knowledge* is violated if any identified mispricing results in uncertainty about the return-generating process. Furthermore, if mispricing is triggered by psychological bias, the EMH assumption of *Rational Information Processing* is violated. Additionally, if the mispricing remains persistent, the EMH assumption of *No Limits to Arbitrage* is violated (Khan, 2011). Investors trade based on the existence of these anomalies and the potential abnormal profits from them. Hence, the more investors are aware, the sooner publicly known anomalies become worthless, the potential abnormal profits from it decays, and therefore disappear with time (McLean and Pontiff, 2016).

Ariel (1987) is the first to find the turn-of-the-month (hereafter referred to as ToM) effect while studying monthly effects in the US stock markets. The ToM effect is a seasonal effect where the returns around the turn of the month are higher than the returns during the rest of the month. Subsequently, Lakonishok and Smidt (1988) verify the presence of the ToM effect in the US market starting on the last trading day of the month followed by the first three trading days of the next month. Consistent with confirmations of existing ToM patterns in the US market, Ogden (1990) considers the cause of the ToM effect as a reaction to standardized payments, such as salary payments, at the turn of the month. Ziemba (1991) discovers an earlier ToM effect in the Japanese stock market since Japanese salary payments occur on the 25th day of the month. This supports Ogden's findings that, as countries' salary payment schedules differ from each other, the ToM effect will consequently appear at dissimilar ToM periods. Agrawal and Tandon (1994) investigate the ToM effect's presence in 19 countries, where ten of the countries have significant monthly seasonal effects. Supplementary, Kunkel et al. (2003) discover existing ToM patterns in the majority of the countries surveyed, declaring the ToM effect as an international occurrence. However, in times of crisis, Muruganandan et al. (2017) show that calendar effects, that were previously present, disappeared during the 2008-2009 financial crisis for several markets. Does this imply that the ToM effect will become insignificant during the Covid-19 pandemic?

1.2 Problem Discussion – Purpose, Aim, and Contribution

The well-known turn-of-the-year (ToY) effect, where small firm stocks receive relatively high returns at the beginning of January, is confirmed to exist on the Swedish stock market (Claesson, 1987; Frennberg and Hansson, 1993). There are many studies about the ToM effect in other countries, yet no previous studies have specifically studied the ToM effect in the Swedish stock market (Rieks, 2016). Hence, the purpose of this study is to perform an investigation into the existence of the ToM effect in the Swedish stock market. Since the ToM effect is considered an international phenomenon, the expected outcome of this study is that there is a significant ToM effect in the Swedish stock market. However, similar to the Japanese stock market, there is a possibility of an earlier ToM effect in the Swedish stock market compared to other countries where this effect is present. This is because salary payments in Sweden occur on the 25th day of the month, which is similar to the Japanese salary payment schedule according to Ziemba (1991). Furthermore, previous research regarding the ToM effect does not take the possible impact of additional global crises, such as the recent Covid-19 pandemic into account. Hence, once this study has sufficient proof of an existing ToM effect on the Swedish stock market, further investigation of the ToM effect during Covid-19 is done to provide information if additional crises have an impact on calendar anomalies. In order to find out if uncertainty among Swedes causes different results, the period of the Covid-19 pandemic is divided into three windows – before Sweden, before vaccinations, and after vaccinations. In Sweden, there were no strict government restrictions, such as lockdown, as there were in many other countries. However, a substantial amount of research finds that during times of crisis investor behavior changes (See, for example, Hoffmann et al., 2013; Foucault et al., 2011; Shim et al., 2009). Furthermore, Ortmann et al. (2020) find that there is an overall increase in trading activities during the first months of the pandemic, but that investors initially are more cautious in their investment decision making, reflecting the risk-averse nature of investors. Thus, the expectation for the Covid-19 period is that there is a persistent ToM effect that is weaker (and possibly less significant) than during the pre-Covid period, due to higher volatility in the stock markets (See, for example, Baker et al., 2020; Zhang et al., 2020). The findings of Chia et al. (2006) agree with these studies since they find that some calendar effects become insignificant during times of crisis when taking the increased volatility in the market into account.

This thesis aims to contribute to the previous research by examining the presence of a ToM effect in the Swedish stock market. Hence, a quantitative research approach is operated on the daily closing price of different indexes with reinvested dividends, chosen to be representative of different company sizes: small cap, mid cap, large cap, and all cap. Precisely, the following research- and sub-questions are examined:

Is there evidence of existing turn-of-the-month (ToM) patterns in the Swedish stock market? Is the ToM effect significant but different during the Covid-19 pandemic[1]?

1.3 Results

The empirical finding from this study proves the existence of the ToM effect in the Swedish stock market in three of the four indexes examined. The average of the daily returns in the Swedish mid- and all cap indexes is significantly[2] higher on the four last trading days of the month and the first trading day of the next month compared to the rest of the month (hereafter referred to as RoM). Furthermore, the daily returns in the Swedish small cap index are significantly[3] higher on the four last trading days of the month and the first two trading days of the following month compared to the RoM. Meanwhile, there is no significant ToM effect in the Swedish large cap index during the entire period of the data, which is from the beginning of January 2010 to the end of April 2022. The ToM effect found in the Swedish stock market is consistent with the initial assumption of an earlier ToM effect compared to other markets due to the salary payments on the 25th day of the month.

The daily returns around the ToM are significantly[4] higher than in the RoM in all the all-, mid-, and small cap indexes during the time of no existing Covid-19 pandemic. Nevertheless, the ToM effect found in the all cap index, representing the entirety of the Swedish market, has disappeared during the entire period of the pandemic, indicating that the ToM effect in this index is not persistent during the time of the Covid-19 pandemic. Meanwhile, at the beginning

[1] The period of the Covid-19 pandemic in Sweden is limited to the beginning of March 2020 to the end of March 2022.
[2] Significant at 1 percent levels for the mid cap indexes (See, Chapter 4.1).
[3] Significant at a 1 percent level for the small cap index (See, Chapter 4.1).
[4] Significant at 10 percent level for the all cap index; significant at 1 percent level for the mid- and small cap indexes (See, Chapter 4.3).

of the Covid-19 pandemic in foreign countries, i.e., January and February 2020, the average of the daily returns around the ToM is significantly[5] lower than in the RoM in both the Swedish mid- and small cap indexes. Consequently, there is a reverse ToM effect at the beginning of the crisis, indicating that the ToM effect is different at the beginning of a potential crisis, as this time is not a time of actual crisis in Sweden since the pandemic is only present in foreign countries. During this time, there is an overall increase of 25.07 percent in the volatility of the all cap index returns compared to the period of the non-Covid-19 pandemic.

During the time of the Covid-19 pandemic in Sweden, both before and after vaccinations, the average of the daily returns around the ToM is once again significantly[6] higher than in the RoM, indicating that the ToM effect is persistent during the time of the Covid-19 pandemic in the Swedish mid- and small cap indexes. The volatility for the different indexes during the time of the pandemic before vaccinations have increased by 72.47 percent compared to the time of the non-Covid-19 pandemic, where the greatest change is an increase of 115.02 percent for the small cap index. Meanwhile, the period of the pandemic after vaccinations have also higher volatility compared to the time of no pandemic, but the increase in the volatility during this period is lower than the increase of the volatility during the earlier periods of the Covid-19 pandemic compared to the time of no pandemic.

1.4 Limitations

The data used in this study is limited to four indexes of different sizes: *OMXSCAPGI*, *OMXS30GI*, *OMXSSCGI*, and *OMXSMCGI*. These indexes represent all cap, large cap, mid cap, and small cap, respectively. The data ranges from 1/4/2010 to 4/22/2022. In this paper,

[5] Significant at 10 and 5 percent levels for the mid cap and small cap indexes, respectively (See, Chapter 4.3).
[6] Significant at a 1 percent level for the both indexes before and after vaccinations (See, Chapter 4.3).

the period of the Covid-19 pandemic in Sweden is limited to the beginning of March 2020 to the end of March 2022.

2.0 Literature Review

2.1 Introduction

There are several studies regarding the ToM effect. However, the research does not cover the existence of the ToM effect in the Swedish stock market. For this study to provide a great understanding for the reader, general information about classical finance theories will be introduced, such as the efficient market hypothesis (EMH). Furthermore, previous studies on the two calendar anomalies, the ToY- and ToM effects are further described and critically discussed, to achieve further credibility. None of the selected studies on the ToM effect cover the impact of the recent crisis, the Covid-19 pandemic outbreak. This study will therefore examine whether the ToM effect is persistent but different during the pandemic, which reveals if crises have an impact on calendar anomalies. In order to explain this anomaly, financial behavior in the stock market is analyzed before, during, and after the pandemic, as the individual investor behavior changes.

2.2 Theoretical Framework

2.2.1 The Efficient Market Hypothesis

Fama's (1970) research indicates that an efficient market is a market that reflects all available data. The efficient market hypothesis is therefore implying that investment strategies cannot outperform the market. This is because of the theory's assumption that a stock is constantly traded at its fair value. Thus, if a stock price is deviating, it will be noticed by a rational investor who will take advantage of this mispricing, which eventually leads the price to its fundamental value. The hypothesis is explained in three variations: weak-, semi-strong- and strong-form. The weak-form suggests that today's stock price is a reflection of all available information regarding past share prices. Meanwhile, semi-strong-form indicates that prices are quickly adjusted to available information and are for that reason unbiased. Lastly, the strong-form holds that prices reflect all information available, both public and private. It also includes information that is both historical and new, as well as current and insider information. Hence, there is no chance of gaining excess returns.

2.2.2 Calendar Anomalies

Market efficiency is very important to the investors as a consequence of markets setting the prices. The expected abnormal returns are zero if there is an absence of mispricing since the markets are efficient. However, if the markets are less efficient this leads to opportunities for making profits due to the mispricing in the stocks. The inefficiency of the markets would therefore lead to non-zero abnormal returns, hence the possibility to predict the mispricing in the market (Singal, 2003). Furthermore, Khan (2011) explains the capital market anomalies as identified mispricing signals that are evaluated by the economic significance and statistical reliability. The causes behind identified mispricing in the market are explained as erroneous measurements because of incorrect statistical reliability, the smaller samples being biased, rational structural uncertainty, investors' psychological prejudices, or due to arbitrage causing remaining mispricing in the stock market. If the mispricing is well known and persistent over time, they are referred to as anomalies.

Seasonality in the financial markets is an indicator of inefficient markets due to identified variations in the market behaviors related to calendar effects (Brooks, 2008). Evidence of existing calendar anomalies has been confirmed by several studies such as the January effect, also known as the ToY effect (Gultekin, M., and Gultekin, N. B., 1983; Roll, 1983; Claesson, 1987; Frennberg and Hansson, 1993; Ogden, 1990), the day-of-the-week (DoW) effect

(Osborne, 1962; Cross, 1973; Gibbons and Hess, 1981), the ToM effect (Lakonishok and Smidt, 1988; Ogden, 1990; Ziemba, 1991; Booth et al., 2001; Agrawal and Tandon, 1994; Kunkel et al., 2003), the Weekend effect (French, 1980), and several other calendar effects. The two calendar anomalies, ToM and ToY effect are relevant to this paper's problematization. The ToM effect is the main subject of this paper, while the ToY effect is shortly described due to its importance in later chapters, the research design. The remaining calendar anomalies are therefore not further discussed.

2.2.2.1 Turn-of-the-Year Effect: January Effect

The ToY effect, also known as the January effect, is a well-documented phenomenon. Gultekin, M., and Gultekin, N. B. (1983) study the yearly effect in 17 capital markets internationally, including the Swedish capital market. The stock market returns are computed from the CIP indexes, representing almost 60 percent of the total market values from January 1959 to December 1979. The authors also study the result when the equally weighted NYSE index is included, from January 1947 to December 1979, which causes a seasonality in the stock return distributions for 13 of the 17 markets examined. This is further described by Gultekin, M., and Gultekin, N. B. as a consequence of smaller firms having more weight in the NYSE index. Consistent with Gultekin and Gultekin's (1983) observations of higher returns in the month of January were found by Claesson (1987) four years later. Claesson studies the ToY effect on the Swedish stock market for the period 1978 to 1984. The results of the study prove the existence of the January effect on the Swedish market, which is persistent with the earlier study of the January effect on an international level. Further, Frennberg and Hansson (1993) examine 72 years of monthly returns in the Swedish stock market. The authors find a higher monthly return for the month of January compared to the remaining months of the year.

Roll (1983) states several potential explanations for the January effect. First, the difference in risk is a reason for the large average return difference between small and large firms. Investors are compensated for being exposed to risks, and these risks have a greater impact on smaller firms, which is a part of the average return differential. The second explanation for the January effect is due to the tax-loss selling at the end of the tax year, where small firm stocks are more affected than the larger firm stocks by the tax-loss selling.

2.2.2.2 Turn-of-the-Month Effect

A similar calendar anomaly as the ToY effect is referred to as the ToM effect. This effect is centered around the turn of the month, and the stock market prices rise during this period. The ToM effect was first introduced by Ariel (1987) when studying monthly effects for the period of 1963 to 1981 on the US stock market. The study finds a pattern of positive average stock returns at the end of each month followed by positive returns during the beginning of the following month for the CSRP index. The ToM effect existed from the last trading day, -1, to the +8 trading days of the following month. Hence, the ToM window used in Ariel's study was [-1: +8]. The first documented ToM effect was therefore during a period of 9-days, which includes a longer period than later studies. The author observes that all the market's cumulative advances occur in the first half of the month in the 19 years of data examined. The study also concludes that the ToM effect is not simply a manifestation of the ToY effect. Since Ariel's observance, several studies on the existence of the ToM effect have been conducted. However, the studies show different periods for when the effect occurs. In Chapter 2.3, several selected studies on this calendar effect are further discussed.

Ogden (1987) explains that the monthly behavior regarding the ToM effect is a reaction to the timing of liquid profits, such as payments of salaries and dividends that are paid on regular calendar dates. The business payment schedules are standardized since the wages normally are received and the obligations are normally paid around the ToM, which causes a growth in returns during that period. Thaler (1987) considers calendar anomalies as a difficult concept to rationalize. However, price movements related to regular payments and receivables on a calendar basis are mentioned by the author as a possible factor causing calendar anomalies. This is consistent with Ogden's reasoning for ToM effects existence.

2.2.3 Investor Behavior during Crises

According to Barber and Odean (2000), institutional investors are more prone to invest in companies that are large, large cap. Falkenstein (1996) analyzes fund portfolio holdings in the US between 1991 and 1992 and suggests that mutual fund managers desire to invest in stocks that are extremely visible and have low transaction costs. For foreign investors, Dahlquist and Robertsson (2001) find a similar study where institutional investors likewise prefer large firms over small firms on the Swedish market. These firms are paying low dividends and are internationally diversified operations. However, Kumar (2009) suggests that individual investors prefer stocks that have lottery characteristics instead, and the demand increases during economic downturns, same as lottery demand. Individual investors are therefore financing larger amounts of capital in stocks with that feature, compared to the institutional investors. Barber and Odean's (2000) study shows that these kinds of stocks are often smaller companies.

Previous studies have shown that during crises individual investor behavior changes, which leads to changes in the volatility and return of the stock market. It is also worth considering how individual investor behavior affects the market in general. According to Bhattacharya et al. (2012), Retail investors' opportunities and behavior differ from institutional investors. This is because of the difference in investment size, but also the limited access to unbiased financial advice. Which according to Seth et al. (2020) makes retail investors' decision-making dependent on rational, but also irrational factors. Further, Fünfgeld and Wang (2017) explain that financial behavior is dependent on individual differences, hence there is a difference in predicting risk and the time preferences. Risk aversion is associated with precautionary savings and cautious consumption. Meanwhile, other investors are more instinctually driven regarding investment decisions. This leads to increased anxiety and predicts hyperbolic discounting behavior for the risk-averse investor.

Baker et al. (2020) study the retail investor's behavior during the time of the Covid-19 pandemic in the USA. A combination of the US government restrictions on commercial activities, the social distancing, and limited knowledge of financial decision-making during the time of the pandemic lead to an unprecedented reaction in the financial markets. According to Shim et al. (2009), financial attitudes are highly related to the amount and availability of financial information and news. Availability is therefore crucial for the investor's ability to manage financial decisions. Hence, Zhang et al. (2020) consider the limited knowledge of investments and financial decision-making during the time of a pandemic, as the main reason for the stock market being highly volatile during the time of the Covid-19 pandemic.

2.3 Previous Research

2.3.1 Turn-of-the-Month Effect

Consistent with Ariel's first documentation on the ToM effect, Lakonishok and Smidt (1988) examine the daily data on the Dow Jones Industrial Average index (DIJA) for the period of 1897 to 1986 to confirm the existence of calendar anomalies in the US market. Lakonishok and

Smidt's study approves the existence of the ToM pattern in the US and concludes that the cumulative returns are greater around the turn of the week, the ToM, the ToY, and around the seasonal holidays. According to the empirical results from Lakonishok and Smidt's study, the total cumulative returns between the last trading day of the month, -1, to the first three trading days of the next month, +3, is higher than the rest of the month. This ToM effect lifespan is therefore different and during a shorter period, [-1: +3], than Ariel's previous research. Further, Ogden (1990) studies the stock index returns of the period 1969 to 1986 of the US stock market indices to find evidence of the ToM effect. The purpose of Ogden's study is to provide information on the ToM effect being related to the standardization payments in the US. The author confirms a ToM effect on the 4 days window, defined as [-1: +3]. The main reasons for the abnormal demands on the market are defined by the author as an immediate investment of the net amount, the remaining amount after the paid obligations. The abnormal demands on the market create an increase in demand for stocks, which leads to higher stock prices at the ToM.

Ziemba (1991) investigates the evidence of existing seasonal behaviors, including the ToM effect in returns on the Tokyo Stock Exchange. Ziemba uses the NSA and TOPIX market indices from 1949 to 1988. The existence of the ToM effect in the Japanese market is approved. However, the empirical results from the study on the Japanese ToM-effect confirm a ToM window starting at trading day -5 to +2 containing a 7-days ToM period. This window reflects an earlier ToM-effect, than what earlier studies approved. Consistent with Ogden's possible explanation for the ToM existence, Ziemba considers that the ToM effect is dependent on the particular country's business practices. Ziemba (1991) essentially claims that the reason for the earlier ToM effect in the Japanese market is because of the country's payment date. Ziemba states that salaries are paid out around the 25th of every month in Japan, while the US has a later payment date, which is the main reason for the difference in the ToM period.

On an international level, Agrawal and Tandon (1994) examine five seasonal patterns, including the ToM effect, in the stock markets of 19 countries. The study results show that ten countries have a significant monthly seasonal effect, during the 5 days starting at the last trading day, -1 to the trading day +4. Another conclusion is that the last trading day of the month has large returns and lower variance in most countries. Sweden was included in the examination from 1971 to 1979, and the empirical results show a significant mean percentage rate of return on the last trading day of the month. The Japanese market shows an earlier ToM effect in the trading days [-4: -1] for 1970 - 1987. Hence, both Sweden and Japan were not approved as countries with significant positive mean returns for the period of the ToM effect in the window [-1: +4].

Seven years later, Booth et al. (2001) investigates the impact of liquidity on the ToM effect in Finland's stock market returns. The empirical results of the study find a higher return on the last trading day of the month, -1, than on the rest of the trading days of the month. This is consistent with the authors' hypothesis of increased buying pressure at the ToM, together with the hypothesis provided by Ogden (1990) regarding standardized payments. Hence, the ToM effect is considered to only be able to exist on a single day. However, Kunkel, Compton, and Beyer (2003) find evidence of existing ToM patterns for the period of 1988 to 2000 for 16 out of their examined 19 countries. Sweden was not included among the countries examined. The authors find that the ToM effect covers 87 percent of the total monthly average returns on the examined countries, within a four-day window. The countries included in the study are reflective of 88 percent of the world's market capitalization value. The result of the existing ToM-effect in the majority of the countries examined led to the conclusion that the ToM effect is an international phenomenon.

2.3.2 Investor Behavior during Crises

To understand the expectations regarding the Covid-19 window of the data it is necessary to analyze the investor behavior during crises. Foucault et al. (2011) find support for the notion that some retail investors, i.e., the opposite of an institutional investor, tend to act as “noise traders” or “liquidity traders” that trade for reasons that are non-informational, and thus contributes to an increase in the volatility of securities prices. In the study, they examine a policy change in the French stock exchange that occurred in September 2000 and led to a change in the behavior of retail traders. The policy change consolidated two main markets, the spot market and one with end-of-month settlements so that there would only be one spot market. This removed the most advantageous market for retail investors since trades after the reform became relatively more expensive due to a decrease in leverage possibilities on trades, resulting in lower retail investor activity. Before the reform retail traders could take long or short positions very easily and with limited capital relative to the position. By comparing volatility, autocovariance of returns as well as the impact of trades before and after the reform, while simultaneously controlling for external factors, they find a significant reduction of the market volatility after the reform. This indicates that some retail traders do act as noise traders and contribute to increased volatility. The view that retail investors trade for non-informational reasons is therefore supported by the findings of the study.

Hoffmann et al. (2013) analyze a combination of brokerage records and monthly questionnaire data for 1510 individual investors in the Netherlands during the financial crisis from April 2008 to March 2009. They find that investors show an initial decrease in risk tolerance and return expectations as well as an increase in overall risk perception during the worst part of the financial crisis. These changes in perception then impact the risk-taking behavior that the individual investor exhibits. However, they do find that risk tolerance and perception are stable over long periods, which is in line with prior research on the area. Furthermore, they find that there is fluctuation in investor perceptions during the crisis window, leading to a decrease in risk tolerance and an increase in risk perception. The changes in perception and behavior show a tendency to recover towards the latter part of the crisis and converge on normal levels.

By looking at transactional data from a UK broker that offers online stock trading to retail investors, Ortmann et al. (2020) find that during the first months of the Covid-19 pandemic, as there was a steep decline in the stock markets, retail investors exhibit caution and reduced levels of risk-taking behavior. However, as the pandemic unfolds there is an increase in retail investor trading activity, resulting in an increase in average weekly trading intensity by 13,9 percent. Chia et al. (2006) analyze the daily closing data in the Malaysian stock market between December 1993 and October 2005. They consider the volatility of the returns in addition to the mean and find that there are different patterns for various calendar effects before and during the Asian financial crisis periods. Seasonal patterns are found to have changed dramatically during the crisis periods and some previously encountered seasonal effects (e.g., the Friday effect) that are present during the pre-crisis period are no longer significant during the crisis when the increased volatility is considered.

2.4 Conclusion

The period of the ToM effect is defined differently, by different authors. Ariel (1987) defines the ToM effect window as [-1: +8]. Meanwhile, Lakonishok and Smidt (1988) and Ogden (1990) find evidence of a shorter window of 4-days [-1: +3]. However, Booth et al. (2001) study of the ToM effect in Finland finds a higher return on the last trading day of the month. Since multiple studies show a significant ToM effect around the globe, it is impossible not to wonder if it exists in Sweden. In Agrawal and Tandon's (1994) study, they find evidence for ten out of eighteen countries to have a significant monthly seasonal effect, for the [-1: +4] window. In this study, neither Sweden nor Japan was approved. Ziemba (1991), on the contrary, suggests that the window of the ToM effect should take the country's payment date into account. This is due to Ziemba's study on the Japanese market, where an earlier ToM effect, [-5: +2], is identified. Does this mean that Sweden can have a significant positive return if the ToM effect is analyzed during a different window?

The evidence of these calendar effects is contradictory to Fama's (1970) theory of EMH. Ogden (1990), Roll (1983), and Thaler (1987) have different explanations of how these anomalies are possible. Ogden's explanation is due to the difference in risk and tax-loss selling at the end of the tax year, while Roll and Thaler agree with the reason for regular payments of liquid assets. The individual and institutional investor behavior could also be an explanation for the ToM effect. According to Kumar (2009), individual investors prefer lottery-type investments. Barber and Odean (2000) explain that these investments are smaller companies. Furthermore, Barber and Odean suggest that institutional investors prefer larger companies. Research into investor behavior tends to show that investors behave irrationally during times of crisis, trading on non-relevant information (Foucault et al., 2011) and thereby increasing market volatility. Also, the risk-taking behavior changes due to a difference in investor risk perception, altering the market behavior of investors during a crisis (Hoffmann et al., 2013). Could the ToM effect therefore change, but still be significant during Covid-19 in comparison to a time when no crisis is affecting the results? As a result where the volatility increases as Foucault et al. (2011) suggest.

3.0 Research Design and Methodology

3.1 Problem, Purpose, and Contribution

The major objective of this study is to test empirically the existence of a ToM effect in the Swedish stock market. Further followed by the impact of the Covid-19 pandemic on the existing ToM effect and its persistence during a time of crisis. The research approach is deductive and quantitative in contribution to previous studies to be able to find empirical findings to test the hypothesis and answer the research questions (See, Chapter 1.2). The study intends to contribute to the earlier research regarding the existence of a ToM effect in other countries by expanding the current knowledge base to include the Swedish stock market (See, Chapter 2.3.1). The aim is to examine the adjusted daily returns from four Swedish indexes (See, Chapter 3.3.1) to test the hypotheses.

H_0: There is no ToM effect in the Swedish stock market.

H_A: There is a ToM effect in the Swedish stock market.

The alternative hypothesis (H_A) aims to test whether the adjusted daily returns for the indexes used representing different cap sizes are significantly higher on the trading days around the ToM. Meanwhile, this alternative hypothesis (H_A) is also the hypothesis to examine the persistence of the ToM effect during the Covid-19 pandemic. The expectation is that the ToM effect is persistent during the time of the pandemic, but different compared to the time of the non-Covid-19 pandemic, which is the time of no crisis.

3.2 Scientific Perspective

This is a quantitative study that is deductive in the meaning that it is designed to test an already existing theory, the turn-of-the-month effect, by using primary data. The existence of a ToM effect in the Swedish stock market is examined by gathering previous data from the Swedish stock market and using regression analysis to test the significance of the returns around the ToM. Since the intention is to empirically test for the existence of this calendar effect that is already established in other markets, the study is deductive. In this kind of study, quantitative is superior to qualitative when designing the type of study, since the objective is to find if there is evidence of this effect in the data, and the results can be considered definitive and not open to interpretation.

3.3 Method

3.3.1 Data Collection

The ToM effect in the Swedish Stock market is examined in this paper by investigating the twelve years of daily observations of closing prices for the following indexes: *OMXSCAPGI*, *OMXS30GI*, *OMXSSCGI*, and *OMXSMCGI*. The closing prices of each index are adjusted to include reinvested dividends. The data for the four chosen indexes are collected from Nasdaq and are chosen to represent different sizes, i.e., market capitalization (Nasdaq, 2022). The *OMXSCAPGI* index is the Stockholm all share index and consists of all the stocks trading on the Swedish stock market. The *OMXS30GI* index contains the 30 most traded stocks on the Swedish stock market and is therefore the index representing the large cap. The *OMXSMCGI* index represents the mid cap index. Meanwhile, the *OMXSSCGI* index is the Nasdaq OMXS small cap index. Each of the collected data for *OMXSCAPGI*, *OMXS30GI*, *OMXSSCGI*, and *OMXSMCGI* indexes contain 3,090 observations of the daily adjusted closing prices starting from 1/4/2010 to 4/22/2022. General statistics on the collected data for each index are presented in Table 1.

Table 1 – General statistics on each index

Index	Earliest	Latest	Obs.	Mean	Std. Dev.	Min	Max
OMXSCAPGI	1/4/10	4/22/22	3,090	204.95	93.28	86.75	468.87
OMXS30GI	1/4/10	4/22/22	3,090	226.61	81.46	109.10	440.38
OMXSMCGI	1/4/10	4/22/22	3,090	323.16	214.44	90.80	944.08
OMXSSCGI	1/4/10	4/22/22	3,090	281.03	179.56	90.77	777.09

3.3.2 Turn-of-the-Month (ToM) Window

The study intends to contribute to the earlier research performed for evidence of existing ToM effects in other countries than Sweden. Roll (1983) finds a stronger ToM effect for the small cap during January and December and explains it as a reaction to the difference in risk between small and large firms, which causes the large average return difference. Hence, each index is examined separately to capture this effect. The summary table of the time horizons, i.e., ToM windows used by previous studies is shown in Table 2.

Table 2 – Summary of the previous ToM effect investigations

Previous Studies [a]	ToM window	Length	Country
Ariel (1987)	[-1: +8]	9-days	USA
Agrawal and Tandon (1994)	[-1: +4]	5-days	International
Ogden (1990); Lakonishok and Smidt (1998); Kunkel et al. (2003)	[-1: +3]	4-days	USA; International
Booth et al. (2001)	[-1]	1-day	Finland
Ziemba (1991)	[-5: +2]	7-days	Japan

a: Previous studies are limited to the earlier studies included in chapter *2.0 Literature Review.*

The ToM window used in Agrawal and Tandon's (1994) study is 5 days starting at the last trading day of the month denoted as -1 continuing to the fourth trading day of the next month. In this paper, this ToM window of [-1: +4] will be used as the first ToM window for the investigation of the Swedish stock market's ToM effect. In absence of significantly higher average daily adjusted returns at the earlier or later trading days in the window, the trading days in the window will be replaced by earlier or later trading days around the ToM. The purpose of this approach is to find the most suitable ToM window for the Swedish stock market's ToM effect. The reason is to choose the window used for several countries rather than only one country. The [-1: +4] window is chosen instead of [-1: +3] among the two windows used in international studies to reduce the risk of missing a possible later ToM effect if it is found to be existent on the fourth trading day of the month as Agrawal and Tandon (1994) have shown to be the case. However, as earlier mentioned, the salary payments in Sweden occur on the 25th day of the month. Therefore, there is a great possibility that the adjustment of the window will be made by moving backward to earlier trading days in the previous month rather than forward to later days of the following month. This is similar to the ToM effect window used in Ziemba's study as the Japanese salary payments also occur on the 25th day of the month. Hence, the possibility of having to adjust the window to include earlier trading days than -5 as in the window used in Ziemba's study is unexpected.

3.3.3 The Period of the Covid-19 Pandemic

The data sample for all the four indexes selected in this study includes the period of the Covid-19 pandemic which is the second main subject. This study will continue to analyze the impact of the Covid-19 pandemic on the examined ToM pattern in the Swedish stock market. To be able to further investigate the difference in how the ToM effect occurs during a time of crisis, the period of the Covid-19 pandemic in Sweden is in this paper limited to the beginning of March 2020 to the end of March 2022.

The outbreak of the Covid-19 virus was first reported at the end of December 2019 by Wuhan Municipal Health Commission in China. The virus continued to spread in several countries until the beginning of March 2020 when the World Health Organization declared the COVID-19 disease a global pandemic (WHO, 2020). For this reason, the period of the two first months of 2020 cannot be considered a time where no crisis exists even if WHO not yet had declared it a global pandemic reaching out to all the countries, including Sweden. The daily closing prices of the sample data are from the beginning of January 2020 until the end of March 2022. It is separated to represent the time of the Covid-19 pandemic before it was announced to be a global pandemic and reached Sweden, and therefore reduces the risk of including a time of no crisis. This time window is further divided three times. The first separated period is referred to as before Sweden (BS). News about the virus in foreign countries is considered to have an impact on Swedish investors' behavior. This includes uncertainties about whether the virus would reach Sweden or not, which could have an impact on financial decision-making, especially for the retail investors in the country (See, Chapter 2.3.2). This time is therefore separated due to its possible interruption in the comparison of the ToM effect during a time when no major crises are present and instead used in order to investigate whether the ToM effect is persistent but different during the time of the Covid-19 pandemic.

The second Covid-window is before vaccinations were available in Sweden, which is denoted as Before Vaccination (BV). This time window is separated to be able to investigate the period of the crisis when the Swedish investors were mostly uncertain about how to make their financial decisions. Along with the absence of any vaccinations to stop the disease and therefore uncertainties regarding how long the pandemic will continue to exist in the country. This window is therefore considered a time with limited information and experience on the crisis and how to make financial decisions during this time (See, Chapter 2.3.2). Further, the third window used for the time of the pandemic in Sweden is when vaccinations were available in the country. This is considered a time of positive expectations regarding the pandemic reaching its end. This window is denoted as After Vaccinations (AV).

Table 3 – The Covid-19 pandemic periods included in each index data

Period	Earliest	Latest	Length
Before Sweden (BS)	1/2/20	2/28/20	41-days
Before Vaccination (BV)	3/2/20	12/23/20	208-days
After Vaccination (AV)[a]	12/28/20	3/31/22	318-days

a: The vaccination against the Covid-19 virus has been offered to Swedish citizens since 27 December 2020 (Krisinformation, 2020).

3.3.4 The Ordinary Least Squares (OLS) Regression

The method used to examine seasonality in financial data is by including seasonal dummy variables in a regression equation. If there are other calendar effects or other effects in the data, but not included in the regression model, the result is likely to be misleading (Brooks, 2008). Hence, the turn-of-the-year (ToY) effect is adjusted for. In this paper, the Ordinary Least Squares regression (OLS) is used to find the ToM effect in the data by running the regression with the adjusted daily returns as the dependent variable, where dummy variables of the trading days are included as the independent variables. The daily adjusted return for each index at time *t* is calculated as $R_t = \frac{P_t - P_{t-1}}{P_t - 1}$ is used in the OLS regressions to investigate the significance of the returns during the ToM window. Where, P_t is the daily adjusted closing price at day *t* and P_{t-1} is the daily adjusted closing price of the day before *t*.

3.3.4.1 The Turn-of-the-Month (ToM) Effect in Sweden

The regression model presented below in Eq. (1) is first run to investigate the existence of the ToM effect on the Swedish Stock Market. This regression includes a dummy variable, where the value is 1 for the trading days around the ToM and 0 otherwise, i.e., trading days on the rest of the month, RoM.

$$R_{i,t} = \alpha_i + \beta_{i,1} D_{i,t}^{ToM} + \varepsilon_{i,t} \tag{1}$$

Where, $R_{i,t}$ is the daily returns on day *t* for each of the indexes *i*, investigated separately. The intercept of the regression is denoted by α_i which represents the average of the daily returns on trading days occurring in the RoM. $D_{i,t}^{ToM}$ is the dummy variable used to represent the daily returns on trading days around the ToM included in the window. Meanwhile, the coefficient is denoted as $\beta_{i,1}$ represents the difference in the average of the daily returns on trading days in the ToM window and the RoM. The error terms of the regression are denoted by $\varepsilon_{i,t}$.

3.3.4.2 The Impact of the Turn-of-the-Year Effect

The turn-of-the-year (ToY) effect, i.e., the January effect is proven to exist in the Swedish stock market (See, Chapter 2.2.2.1). To test whether the existence of the ToM effect in the Swedish stock market presented in Eq. (1) is independent of the ToY effect, another regression is run. This regression is presented below as Eq. (2) and includes two dummy variables: ${D_{i,t}}^{ToM}$ and $D_{i,t}^{ToY}$. The ToM dummy variable is denoted as ${D_{i,t}}^{ToM}$ and takes on the value 1 for the daily returns on trading days around the ToM in the ToM window, and takes value 0 for the RoM. The ToY dummy variable, denoted as $D_{i,t}^{ToY}$, takes value 1 for the daily returns on trading days in January and December, and takes value 0 for the rest of the year, RoY. Interaction on the

ToM variable and the ToY variables, i.e., ${D_{i,t}}^{ToM} \cdot D_{i,t}^{ToY}$ included in the regression model represent the relationship between the daily returns on trading days in the ToM window occurring in January and December, i.e., when ToM occurs at the turn of the year, ToY.

$$R_{i,t} = \alpha_i + \beta_{i,1} D_{i,t}^{ToM} + \beta_{i,2} D_{i,t}^{ToM} \cdot D_{i,t}^{ToY} + \varepsilon_{i,t} \quad (2)$$

Where, $R_{i,t}$ denotes the daily returns for each index *i*, examined separately. α_i represent the average of the daily returns on trading days in the RoM. $\beta_{i,1}$ represent the difference between the average of the daily return on trading days in the ToM window during the RoY and all other trading days outside this window. Further, $\beta_{i,2}$ is the coefficient for the interaction between the ToM and ToY variables representing the difference between the average of the daily returns on the trading days included in the ToM window during ToY and on all other trading days outside of this window. The error terms included in the regression are denoted by $\varepsilon_{i,t}$.

3.3.4.3 Turn-of-the-Month Effect during the Covid-19 Pandemic

The investigated ToM effect on the Swedish stock market will further be examined during the Covid-19 pandemic. Another OLS regression is performed for the investigation of the difference in the ToM patterns on the Swedish stocks during the three periods of the Covid-19 pandemic: BS, BV, and AV (See, Chapter 3.3.3). The regression model is presented below as Eq. (3) and includes interaction on the ToM dummy variable, $D_{i,t}^{ToM}$ with three dummy variables used for the periods of BS, BV and AV denoted as $D_{i,t}^{BS}$, $D_{i,t}^{BV}$, and $D_{i,t}^{AV}$, respectively.

The ToM dummy variable takes similar to the earlier regressions in Eq. (1) and Eq. (2) the value 1 for the trading days within the ToM window and further takes value 0 for other trading days, i.e., in the RoM. $D_{i,t}^{BS}$ is a dummy variable taking value 1 for all trading days in January

2020 and February 2020, which is the BS period earlier described in Chapter 3.3.3, and takes value 0 for all other trading days in the sample, i.e., from the beginning of January 2010 to the end of April 2022 (See, Table 1). Further, the second dummy variable denoted as $D_{i,t}^{BV}$ takes on the value of 1 for the daily returns on all trading days from the beginning of March 2020 to the end of December 2020 representing the time of the pandemic before vaccinations in Sweden, and takes the value of 0 for all other trading days included in the sample. $D_{i,t}^{AV}$ takes on value 1 for all trading days from the end of December 2020 to the end of March 2022 representing the AV period which is the time of the pandemic after vaccinations are available (See, Table 3).

$$R_{i,t} = \alpha_i + \beta_{i,1} D_{i,t}^{ToM} + \beta_{i,2} D_{i,t}^{ToM} \cdot D_{i,t}^{BS} + \beta_{i,3} D_{i,t}^{ToM} \cdot D_{i,t}^{BV} + \beta_{i,4} D_{i,t}^{ToM} \cdot D_{i,t}^{AV} + \varepsilon_{i,t} \quad (3)$$

Where $R_{i,t}$ denotes the daily returns for each index i, examined separately. α_i is the intercept in the regression model representing the average of the daily returns on trading days in the rest of the month, RoM. $\beta_{i,1}$ represent the difference between the average of the daily returns on trading days within the ToM window and RoM while there is no Covid-19 pandemic. Further, the coefficient of the interactions on the ToM dummy variable with $D_{i,t}^{BS}$, $D_{i,t}^{BV}$, and $D_{i,t}^{AV}$, are denoted as $\beta_{i,2}$, $\beta_{i,3}$, and $\beta_{i,4}$ which represent the difference between the ToM during the BS, BV, and AV periods and the rest of the trading days outside these windows, respectively. The error terms of the regression are denoted by $\varepsilon_{i,t}$.

3.3.4.4 Volatility and Heteroscedasticity

Since the ToM effect is expected to be different during the Covid-19 pandemic due to an increase in the volatility of the returns (Zhang et al, 2020; Chia et al., 2006) the volatility in daily returns is investigated. The volatility, defined as standard deviation, of the daily returns is calculated for each index and each time window used, to examine whether there is evidence of higher volatility during the pandemic compared to the period of no Covid-19 pandemic. Further, comparisons are made between the volatility for the different indexes as well as Covid-19 periods and the volatility of the time of no pandemic, to find the percentage change in volatility. If the volatility is significantly higher during the Covid-19 periods, which is expected, this might be an indication of non-constant variance and heteroscedasticity, in the model. Hence, a Breusch-Pagan test for heteroscedasticity is also performed to conclude if the variance is constant.

3.3.5 Test Hypothesis

Given the results from the regressions performed, a two-sided alternative hypothesis is used to test the estimated parameters, e.g., $\hat{\beta}_{i,1}$ representing the difference between the average of the daily returns in a specific ToM window and the RoM. If the null hypothesis, $H_0\colon \beta_{i,1} = 0$, is rejected at 1, 5, or 10 percent significance levels, and if the true value of the estimated parameter, i.e., $\beta_{i,1}$ in this case, lies within a greater than zero range of 99, 95, or 90 percent confidence intervals, the conclusion from the performed test is that there is enough evidence of existing ToM effect in the data sample, examined.

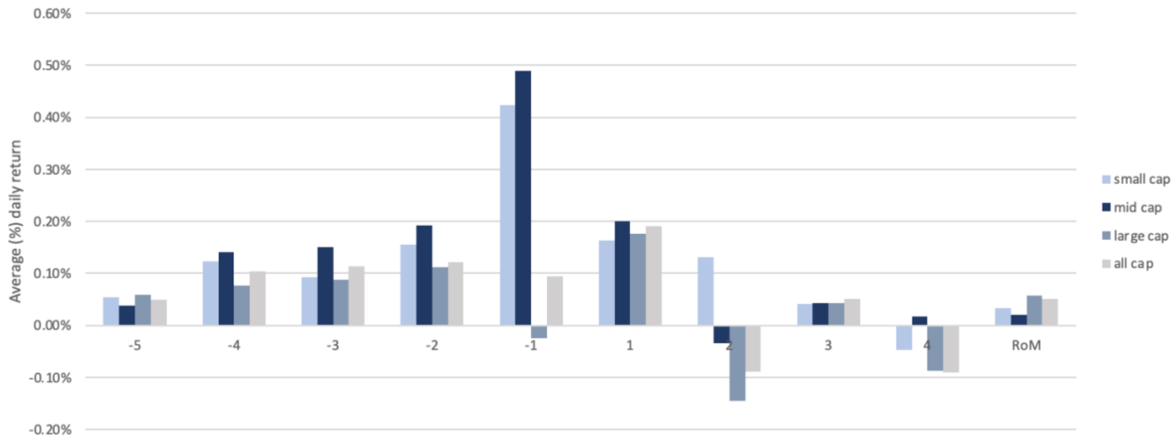
After investigating the volatility in the index returns, if significantly higher volatility is present, a Breusch-Pagan test for heteroscedasticity will be performed for each of the time windows and indexes. If the null hypothesis of the test, that the variance is constant, is rejected at the 1, 5, or 10 percent significance levels, the conclusion from the test is that there is heteroscedasticity in the model, which will affect the reliability of the explanatory power in the OLS regression model.

4.0 Empirical Results and Analysis

4.1 The Turn-of-the-Month Effect in Sweden

The empirical results from Eq. (1) show different ToM patterns for each of the four indexes used in this study. The results from the first regression for the [-1: +4] ToM window show that the window used in Agrawal and Tandon's (1994) study is not a suitable window for the existence of the ToM effect in the Swedish stock market. Especially for the large cap and the all cap indexes since the average of the daily returns in this ToM window is both insignificant, but also lower than in the RoM. Hence, the earlier ToM window of [-5: +2] used in Ziemba's (1991) study is further examined to find the possibility of an earlier ToM effect in the Swedish stock market. The estimated parameters from Eq. (1) for the ToM windows of [-5: +2] and [-1:+4] are presented in Appendix A.

Figure 1 – Average of the percentage daily returns on trading days -5 to +4 around the ToM

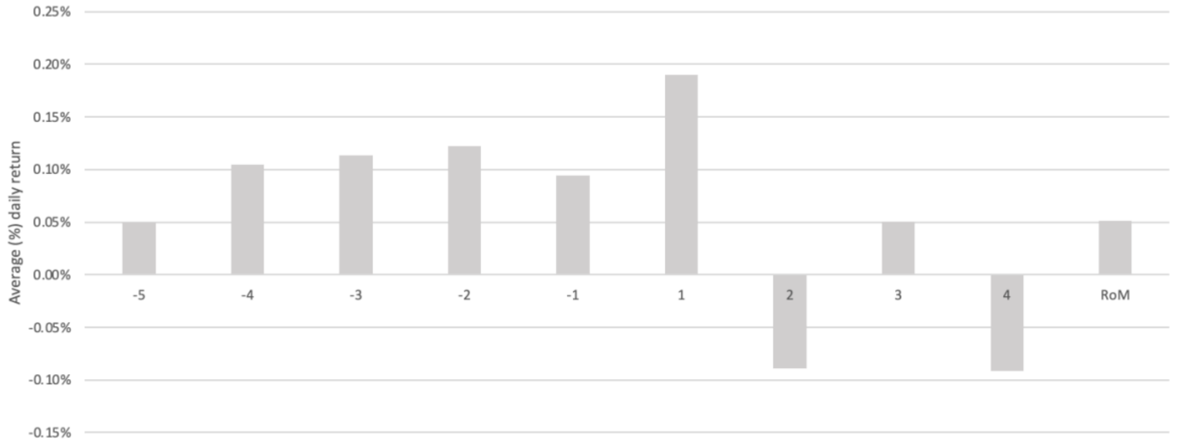


For the period: 1/4/10 – 4/22/22

Figure 1 shows the average of the percentage daily returns on each of the -5 to +4 trading days around the ToM for all the four indexes used in this study. Trading days of -5 to +4 around the

ToM are chosen to visualize a combination of Ziemba's (1991) earlier ToM window of [-5: +2] and the ToM window of [-1: +4] used in Agrawal and Tandon's (1994) study.

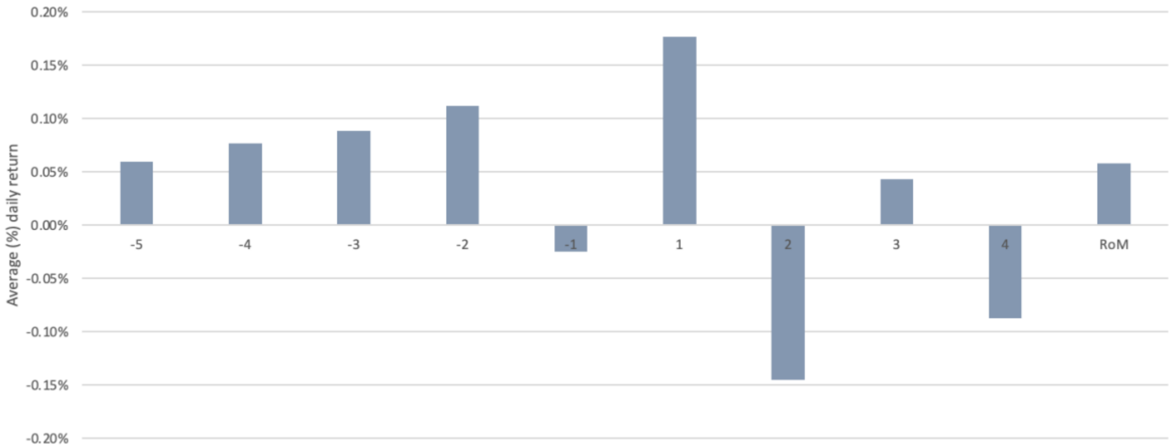
Figure 2 – Average of the percentage daily returns on trading days -5 to +4 in the all cap index



For the period: 1/4/10 – 4/22/22

As it is shown in Figure 2, the average of the daily returns for the all cap index on trading days -4 to +1 around the ToM is approximately equal to 0.13 percent, which is significantly higher than the average of the daily returns on the rest of the month. Given the t-value of 1.90 obtained from the standard error of $SE(\hat{\beta}_{i,1}) \approx 0.00048$ related to the estimated parameter for the ToM window [-4: +1], i.e., $\hat{\beta}_{i,1} \approx 0.00092$, the null hypothesis, $H_0: \beta_{i,1} = 0$, is rejected at a 10 percent significance level (See, Appendix B). The conclusion from rejecting the null hypothesis is that the true value of the estimated parameter is significantly different from 0 and higher than α_i. Hence, the historical daily returns in the data for the all cap index provide sufficient evidence for an existing ToM effect on -4 to +1 trading days of the month as it is significantly higher than in the RoM.

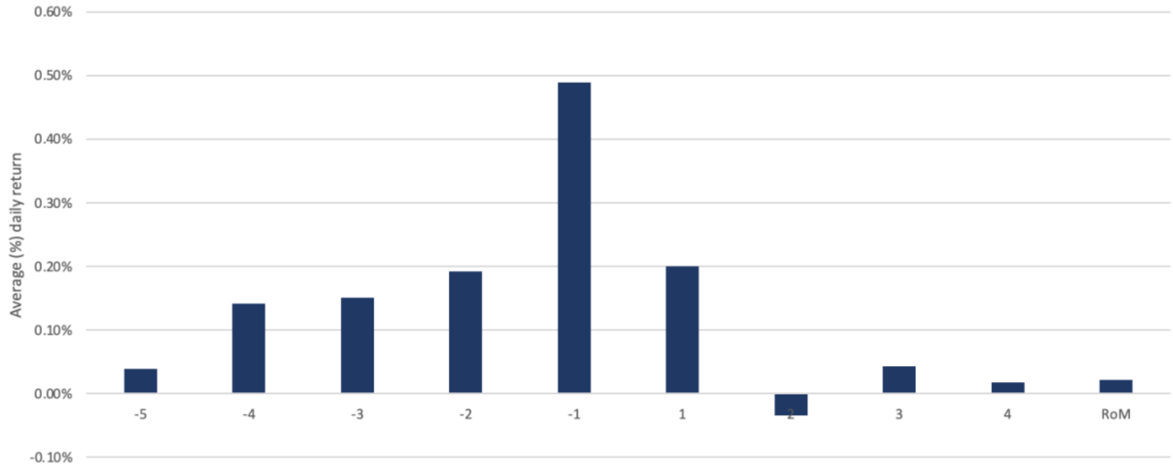
Figure 3 – Average of the percentage daily returns on trading days -5 to +4 in the large cap index



For the period: 1/4/10 – 4/22/22

As it is shown in Figure 3, the average of the large cap index's daily returns on -4 to -2 trading days is higher than the RoM. However, the average of the daily returns on the last trading day of the month is less than zero meanwhile daily returns on the first trading day of the month is on average the highest compared to the rest of the trading days included in the figure and is approximately 0.12 percentage points higher than all the other trading days than the -5 to +4 trading days, which is denoted as the RoM in the figure. Nevertheless, neither of the tested ToM windows, nor the first trading day of the month has on average significantly higher daily returns than in the RoM, as the null hypothesis is failed to be rejected at 1, 5, and 10 percent significance levels (See, Appendix A and Appendix B). The conclusion is that there is no statistical evidence of an existing ToM effect in the Swedish large cap index from the beginning of January 2010 to the end of April 2022.

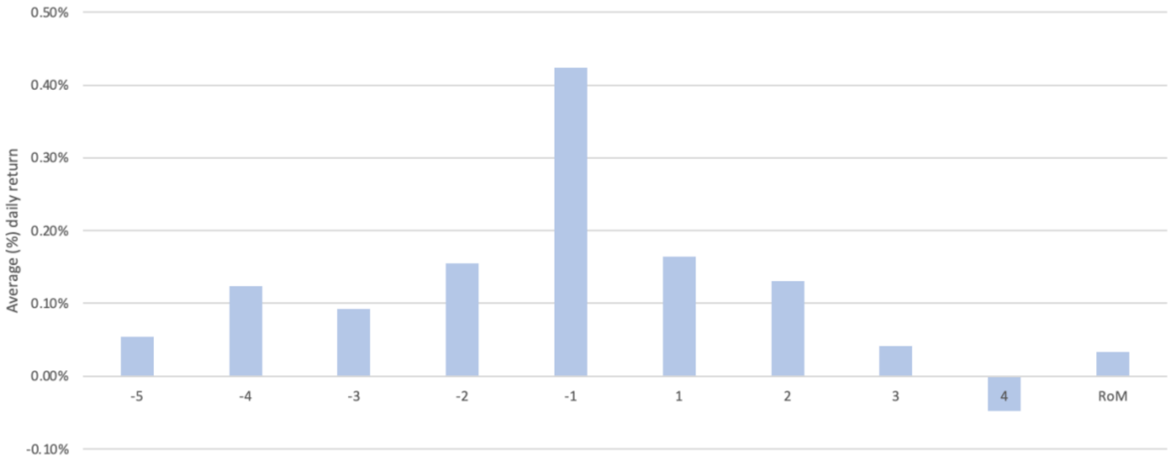
Figure 4 – Average of the percentage daily returns on trading days -5 to +4 in the mid cap index



For the period: 1/4/10 – 4/22/22

Figure 4 shows the average of the daily returns on -5 to +4 trading days around the ToM in the mid cap index. The estimated parameter, $\hat{\beta}_{i,1}$, representing the difference between the daily return on trading days -4 to +1 and the RoM for the mid cap index is approximately equal to 0.00215 with a standard error of $SE(\hat{\beta}_{i,1}) \approx 0.00044$. Given the obtained t-value of 4.87 from this parameter, the null hypothesis, $H_0: \beta_{i,1} = 0$, is rejected at a 1 percent significance level indicating that the difference between the daily return on trading days -4 to +1 is significantly different and higher than the RoM. The conclusion from rejecting the null hypothesis is that there is strong evidence of an existing ToM effect in the Swedish mid cap index (See, Appendix B). Hence, the ToM window of [-4: +1] is the preferred window explaining the ToM effect in the Swedish mid cap index, which is similar to the window for the Swedish all cap index.

Figure 5 – Average of the percentage daily returns on trading days -5 to +4 in the small cap index



For the period: 1/4/10 – 4/22/22

The average of the daily returns for the small cap index on -5 to +4 trading days around the ToM is shown Figure 5. The most suitable window for the Swedish small cap index is a [-4: +2] ToM window as this window is significantly higher than the RoM. The estimated parameter representing the difference in the average of the daily returns on the four last trading days of the month followed by the first two trading days of the next month compared to the RoM is approximately equal to 0.00152 with its related standard error is approximately equal to 0.00036 (See, Appendix B). Given the obtained t-value of 4.00, the null hypothesis, $H_0: \beta_{i,1} = 0$, is rejected at a 1 percent significance level indicating there is strong evidence of existing ToM effect in the Swedish small cap index as the daily returns on trading days of -4 to +2 are significantly different and higher than in the rest of the month. The small cap index is the only index in this study that have an existing ToM effect in a 6-days ToM window, which is dissimilar to the 5-days ToM window of [-4: +1] explaining the ToM effect in the Swedish mid- and all cap indexes.

4.2 The Impact of the Turn-of-the-Year Effect

The estimated parameters of the second regression in Eq. (2) are presented in Appendix C. The table below is a summary table of the average of the daily returns in the ToM window during January, December, i.e., ToY, and during the rest of the year, RoY.

Table 4 – The impact of the ToY effect on the average of percentage daily returns around the ToM

Index	Average (%) daily returns	
	ToM in RoY	ToM in ToY
OMXSCAPGI (all cap)	0.1189*	0.1549
OMXSMCGI (mid cap)	0.2148***	0.3307***
OMXSSCGI (small cap)	0.1418***	0.3762***

*/ **/ *** Significant at 0.10/ 0.05/0.01 level.

The average of the daily returns on -4 to +1 in the all cap index is significantly higher than the RoM during the RoY as the null hypothesis, $H_0\colon \beta_{i,1} = 0$, is rejected at a 10 percent significance level. The t-value is equal to 1.65, which is obtained from $\hat{\beta}_{i,1} \approx 0.00086$ and $SE(\hat{\beta}_{i,1}) \approx 0.00052$. The conclusion from rejecting the null hypothesis is that the true value of the estimated parameter is significantly different and is higher than zero. However, the null hypothesis, $H_0\colon \beta_{i,2} = 0$, fail to be rejected at 1, 5, or 10 percent significance level. Hence, the ToM effect is not significantly higher than the RoM during the month of January and December indicating that the evidence of an existing ToM effect in the all cap index is independent of the existing ToY effect in Sweden. Furthermore, the average of the daily returns in the mid cap index on -4 to +1 trading days around the ToM is significantly higher than RoM both during the RoY and ToY as the null hypothesis for both of the estimated parameters of $\hat{\beta}_{i,1} \approx 0.00195$ and $\hat{\beta}_{i,2} \approx 0.00311$ are rejected at a 1 percent significance level as their t-values are equal to 4.11 and 3.25, respectively. The conclusion from rejecting the null hypothesis is that there is strong evidence of an existing ToM effect in the mid cap index on -4 to +1 trading days around the ToM which is not only a reflection of an existing ToY effect.

The average of the daily returns on -4 to +2 in the small cap index is significantly higher than the RoM during the RoY and ToY. The null hypothesis, H_0: $\beta_{i,1} = 0$, is rejected at a 1 percent significance level as the t-value obtained from $\hat{\beta}_{i,1} \approx 0.00112$ and $SE(\hat{\beta}_{i,1}) \approx 0.00041$, i.e., $t_{\hat{\beta}_{i,1}}$ is equal to 2.76. The conclusion from rejecting the null hypothesis at a 1 percent significance level is that there is strong evidence of a ToM effect even in other months than January and December. This indicates that the evidence of higher returns on -4 to +2 trading days around the ToM in the small cap index is not found due to the existing ToY effect in the historical returns in the data. Further, the null hypothesis, H_0: $\beta_{i,2} = 0$, is also rejected at a 1 percent significance level since the obtained t-value, i.e., $t_{\hat{\beta}_{i,2}}$, from $\hat{\beta}_{i,2} \approx 0.00346$ and $SE(\hat{\beta}_{i,2}) \approx 0.00080$ is equal to 4.32. The conclusion from rejecting this null hypothesis is that the ToM effect still is highly significant when it occurs in the ToY. Hence, there is strong evidence of a ToM effect in the Swedish small cap index, which is not a reflection of an existing ToY effect in the data. Further, as there is no evidence of an existing ToM effect in the Swedish large cap index, the results from the performed regression for the large cap index are still insignificant (See, Appendix C).

4.3 Turn-of-the-Month Effect during the Covid-19 Pandemic

The investigated ToM effect on the Swedish stock market is examined during the three periods of the Covid-19 pandemic. The estimated parameters from the regression in Eq. (3) performed for each of the indexes are presented in Appendix D and are further described in this chapter.

Table 5 – The ToM effect during the Covid-19 pandemic in the all cap index

Period	Average (%) daily return in ToM
No Covid-19 pandemic	0.1243*
Before Sweden (BS)	-0.5593
Before Vaccination (BV)	0.1844
After Vaccination (AV)	0.1826

*/ **/ *** Significant at 0.10/ 0.05/0.01 level.

The estimated parameter for the all cap index representing the difference between the average of the daily returns in the [-4: +1] window during a time of no pandemic and in the RoM, i.e., $\hat{\beta}_{i,1}$, is approximately equal to 0.00091. The t-value is obtained from $\hat{\beta}_{i,1}$ and its associated standard error, $SE(\hat{\beta}_{i,1}) \approx$ 0.00052 is equal to 1.74. For this reason, the null hypothesis, $H_0: \beta_{i,1} = 0$, is rejected at a 10 percent significance level. There is a 90 percent confidence that the true average of the daily returns on the ToM window of [-4: +1] is within the range of 0.00005 to 0.00178 which is greater than zero. The conclusion from this test is that the ToM effect in the all cap index is significant during a time of no Covid-19 pandemic.

Table 6 – The ToM effect during the Covid-19 pandemic in the mid cap index

Period	Average (%) daily return in ToM
No Covid-19 pandemic	0.2087***
Before Sweden (BS)	-0.6075 *
Before Vaccination (BV)	0.4709***
After Vaccination (AV)	0.3986***

*/ **/ *** Significant at 0.10/ 0.05/0.01 level.

The estimated parameter, $\hat{\beta}_{i,1}$, represents the difference between the average of the daily returns during a time of no pandemic and the RoM in the mid cap index. As the t-value, $t_{\hat{\beta}_{i,1}}$obtained from $\hat{\beta}_{i,1} \approx$ 0.00189 and $SE(\hat{\beta}_{i,1}) \approx$ 0.00048 is equal to 3.97, the null hypothesis, $H_0: \beta_{i,1} = 0$, is rejected at a 1 percent significance level. There is a 99 percent confidence that the true value of the difference between the ToM returns and the RoM during the time of the pandemic is within a range of 0.00066 to 0.00312, which is greater than 0. Hence, the conclusion is that the ToM effect is significant during a time of no pandemic given the historical returns in the data for a time of no Covid-19 pandemic. Further, as $\hat{\beta}_{i,2} \approx$ -0.00627 and $SE(\hat{\beta}_{i,2}) \approx 0.00330$ obtain a t-value of -1.90, the null hypothesis, $H_0: \beta_{i,2} = 0$, is rejected at a 10 percent significance level. There is a 90 percent confidence that the true difference between the average of the daily returns in the [-4: +1] window during the BS period of the pandemic and the RoM lies within the range of -0.01171 to -0.00084. Hence the conclusion from rejecting the null hypothesis is that the ToM effect during the BS period of the pandemic is significant but different compared to the time of no pandemic, as the average of the returns on -4 to +1 trading days around the ToM are significantly lower than in the RoM.

The estimated difference between the average of the daily returns in the ToM window during the BV period and in the RoM, i.e., $\hat{\beta}_{i,3}$ is approximately equal to 0.00451. The null hypothesis, $H_0: \beta_{i,3} = 0$, is rejected at a 1 percent significance level as the t-value obtained from $\hat{\beta}_{i,3}$ and its related standard error of$SE(\hat{\beta}_{i,3}) \approx$ 0.00154, is equal to 2.94. There is a 99 percent confidence that the true difference in the ToM returns during the BV period of the pandemic and RoM, i.e., $\beta_{i,3}$, lies within the range of 0.00055 to 0.00847, which indicates that the returns on -4 to +1 trading days around the ToM during the BV period is on average significantly higher than in the RoM. Furthermore, , $\hat{\beta}_{i,4}$ is representing the estimated parameter for the difference between the average of the daily returns during the AV period of the pandemic and its related standard error are approximately equal to 0.00379 and 0.00120, respectively. Hence, due to the obtained t-value of 3.16, the null hypothesis, $H_0: \beta_{i,4} = 0$, is also rejected at a 1 percent significance level. There is a 99 percent confidence that $\beta_{i,4}$ lies within the range of

0.00070 to 0.00688 indicating the ToM returns in the AV period of the pandemic are also significantly higher than the RoM.

Table 7 – The ToM effect during the Covid-19 pandemic in the small cap index

Period	Average (%) daily return in ToM
No Covid-19 pandemic	0.1560***
Before Sweden (BS)	-0.5187**
Before Vaccination (BV)	0.4608***
After Vaccination (AV)	0.2996***

*/ **/ *** Significant at 0.10/ 0.05/0.01 level.

The average of the daily returns in the small cap index on -4 to +2 trading days around the ToM during a time of no pandemic is estimated as $\hat{\beta}_{i,1} \approx$ 0.00126. Given a t-value of 3.09 obtained $\hat{\beta}_{i,1}$ and $SE(\hat{\beta}_{i,1}) \approx$ 0.00041, the null hypothesis, $H_0: \beta_{i,1} = 0$, is rejected at a 1 percent significance level indicating that there is a 99 percent confidence that $\beta_{i,1}$ is within a range of 0.00021 to 0.00231, indicating that the true average of the daily returns on -4 to +2 is significantly higher than in the RoM. Hence, the conclusion is that the ToM effect exists during a time of no pandemic in the small cap index. Furthermore, a t-value of -2.00 is obtained from $\hat{\beta}_{i,2} \approx$ -0.00549 and $SE(\hat{\beta}_{i,2}) \approx$ 0.00275, thus the null hypothesis, $H_0: \beta_{i,2} = 0$, is rejected at a 5 percent significance level. There is a 95 percent confidence that $\beta_{i,2}$ lies within the range of -0.01088 to -0.00010. Hence, the conclusion from rejecting the null hypothesis is that the average of the daily returns in the small cap index on -4 to +2 trading days around the ToM during the BS period of the pandemic is significantly lower than in the RoM.

The estimated parameter, i.e., $\hat{\beta}_{i,3}$, representing the difference between the average of the daily returns in the [-4: +2] window during the BV period of the pandemic, is approximately equal to 0.00431. Given the t-value of 3.38 obtained from $\hat{\beta}_{i,3}$ and its standard error of $SE(\hat{\beta}_{i,3}) \approx$

0.00127, the null hypothesis, $H_0: \beta_{i,3} = 0$, is rejected at a 1 percent significance level. There is 99 percent confidence that $\beta_{i,3}$ lies with the range of 0.00102 to 0.00759, which is greater than 0. Hence, the conclusion from the rejection of the null hypothesis is that the average of the daily return in the small cap index on -4 to +2 trading days around the ToM during the BV period of the pandemic is significantly higher than the RoM. Further, the null hypothesis, $H_0: \beta_{i,4} = 0$, is also rejected at a 1 percent significance level, as the t-value obtained from $\hat{\beta}_{i,4} \approx 0.00269$ and $SE(\hat{\beta}_{i,4}) \approx 0.00101$, is equal to 2.68. There is 99 percent confidence that $\beta_{i,4}$ lies within the range of 0.00010 to 0.00529, which is greater than 0. The conclusion from the rejected null hypothesis is that the average of the daily returns in the small cap index on -4 to +2 trading days of the month during the AV period of the pandemic is significantly greater than in the RoM. Hence, the ToM effect in the small cap index is persistent during the time of the pandemic and is different during the BS period as the returns around the ToM are significantly lower than in the RoM.

4.4 Volatility and tests for Heteroscedasticity

Tables 8-11 show the percentage change in volatility (standard deviation) for each of the indexes and the different periods used in this study. The volatility for the different periods and indexes are presented in Appendix E.

Table 8 – Percentage change in the volatility of returns for BS compared to no Covid

Index	Percentage change in volatility (standard deviation)
OMXSCAPGI (all cap)	25.07
OMXS30GI (large cap)	17.67
OMXSMCGI (mid cap)	42.88
OMXSSCGI (small cap)	65.39

As it is demonstrated in Table 8, for the period when the pandemic was starting to spread but before any cases were confirmed in Sweden, there is an overall increase in the volatility of the index returns compared to the period with no Covid. Overall, the volatility in the Swedish stock market increased by 25.07 percent.

Table 9 – Percentage change in volatility of returns for BV compared to no Covid

Index	Percentage change in volatility (standard deviation)
OMXSCAPGI (all cap)	72.47
OMXS30GI (large cap)	65.09
OMXSMCGI (mid cap)	97.87
OMXSSCGI (small cap)	115.02

The volatility for the different indexes during the time of the pandemic reaching Sweden but before vaccinations are shown in Table 9 For the market as a whole the volatility is 72.47 percent higher than the period with no Covid-19. The biggest change is in the small cap index, which shows increased volatility by 115.02 percent.

Table 10 – Percentage change in the volatility of returns for AV compared to no Covid

Index	Percentage change in volatility (standard deviation)
OMXSCAPGI (all cap)	9.35
OMXS30GI (large cap)	-3.59
OMXSMCGI (mid cap)	42.43
OMXSSCGI (small cap)	55.97

Table 10 shows the percentage change in volatility for the different indexes during the period where there was a pandemic even in Sweden, but after the vaccinations had begun. For this period there is a clear difference in that the volatility is still higher than the period of no Covid-19 in the Swedish market. However, the volatility is much lower than the other Covid-windows examined. Notably, the large cap index has lower volatility in the returns compared to the period with no Covid.

Table 11 – P-values from the Breusch-Pagan test for heteroscedasticity for the different windows

	[-1:+4]	[-5:+2]	[-4:+1]	[-4:+2]	[-4:+2] with ToY	[-4:+1] with ToY	[-4:+2] With Covid	[-4:+1] with Covid
All cap	0.325	0.2009	0.5421	0.3122	N/A	0.3176	N/A	0.0602
Large cap	0.455	0.8209	0.6053	0.971	N/A	0.9318	N/A	0.3278
Mid cap	0.0706	0.0046	0.0025	0.0022	N/A	0.0005	N/A	0.0133
Small cap	0.5413	0.0016	0.0091	0.0016	0.006	N/A	0.0941	N/A

Table 11 shows the p-values from the Breusch-Pagan test for heteroscedasticity for the different ToM-windows and indexes. The null hypothesis of the test is that there is constant variance in the data. Therefore, if the null hypothesis is rejected there is significant evidence of heteroscedasticity. For the small cap and mid cap indexes, there is strong evidence for heteroscedasticity for all the windows, except for the [-1: +4] window for the small cap index, since the null hypothesis is rejected at least the 10 percent level. The large cap index has no significant heteroscedasticity for any of the ToM-windows. For the all cap index only the [-4: +1] window during the covid pandemic shows any sign of heteroscedasticity since it is rejected at the 10 percent level.

5.0 Discussion and Critical Reflection

There is evidence of an existing ToM effect in the Swedish stock market. For the mid cap and all cap indexes, the daily returns on the four last trading days of the month and the first trading day of the next month are on average significantly higher than the average of the daily returns on all other trading days in the rest of the month. The small cap index's daily returns are significantly higher on the last four trading days of the month and the first two trading days of the following month. However, no significant ToM effect is present for the large cap index.

The empirical results suggest that the ToM effect in Sweden in the entire period of the data, i.e., when the period of the pandemic is included, is similar to the window used in Ziemba's (1991) study, but with smaller windows, corresponding to [-4, +1] for the mid cap and all cap indexes and [-4, +2] for the small cap index. Hence, these results indicate a ToM effect window that is not prominent in any of the other studies performed in other markets, but unique when it comes to the scope of the ToM effect compared to previous research. An earlier ToM effect window was anticipated at the beginning of this study since this is in line with the assumptions that earlier payment schedules influence the ToM effect, consistent with Ogden's (1990) and Ziemba's (1991) findings. This is analogous to the Swedish model of having salary payments on the 25th of each month. Furthermore, the ToM effect is not merely a side effect of the ToY effect, since controlling for the ToY effect by including January and December in the regression shows that the ToM effect still is highly significant. Hence, the existence of the significance of the ToM effect under these conditions disproves the notion that the ToM effect is only a reflection of the ToY effect, which is in line with what Ariel (1987) finds. Arguably, there is a need for further research on the ToM effect in the Swedish stock market to determine the main causes of its persistence; since it defies the fundamental assumptions that the markets are efficient. One explanation proposed by the authors of this paper is that the lack of research into this calendar anomaly, i.e., the turn-of-the-month (ToM) effect, regarding the Swedish stock market persists due to the insufficient awareness of the ToM effect by the Swedish investors. The conclusion, thus far is that the ToM effect is present in the Swedish stock market but with a different ToM effect window compared to other markets studied. This indicates that this is an effect present in most markets worldwide, but that the window for which the effect is statistically significant differs between countries based on investor behavior and standardized payments, e.g., salary. Other possible factors may affect this as well but these have yet to be determined. The results support the notion that the ToM effect is an international phenomenon. However, further research in this area is warranted, and different ToM windows should be considered for the different markets.

The expectations for the period of the Covid-19 pandemic were that the ToM effect is different compared to the period with no Covid, since previous studies have shown that times of crisis are related to an increase in volatility (Zhang et al., 2020) but also a higher perception of, and lower tolerance for risk (Hoffmann et al., 2013). In times of crisis, when there is increased volatility, some calendar effects have also been shown to be weaker (Chia et al., 2006). When examining the volatility of the different indexes and the different periods in the Swedish market, as well as how the volatility changes between the windows, there is evidence of increased volatility during the first part of the Covid-19 pandemic. The period of the beginning of the Covid-19 pandemic, but before there is a pandemic in Sweden shows an increase in volatility of 25.07 percent in the all cap index compared to the period of no pandemic. When the pandemic has reached Sweden, but before vaccinations, the overall increase in the volatility of returns is 72.47 percent higher than the no Covid-period. Only after vaccinations have begun, there is evidence of lower volatility. It is still higher than when there is no pandemic by

9.35 percent, but the overall volatility is lower than in the previous Covid-periods. The conclusion is that these results support the expected hypothesis of a potentially different, weaker, ToM effect during the Covid-19 pandemic. There is also, however, a need to address the impact of the increased volatility on the regression models, since such a significant change in volatility may be an indication of heteroscedasticity in the data. Indeed, the Breusch-Pagan test for heteroscedasticity reveals certain evidence of possible non-homogeneously distributed error terms for several indexes, examined. The small- and mid cap indexes show significant evidence of heteroscedasticity for almost all the ToM windows tested, whereas the large- and all cap indexes cannot reject the null hypothesis of constant variance for most of the ToM windows, indicating that there is constant variance in the data sample. The only exception is for the [-4: +1] window for the all cap index during the Covid-19 pandemic which is rejected at the 10 percent significance level. Heteroscedasticity may weaken the explanatory power of the OLS regressions. Hence, in the authors' opinion, further research is necessary on the ToM effect during crises where volatility is thoroughly examined. However, a conclusion can be drawn, that for the Swedish stock market as a whole, there is no heteroscedasticity present in the period with no Covid-19. This further strengthens the result that there is ToM effect in the non-Covid-19 period.

The study shows that the Swedish ToM effect is persistent during the whole period of the Covid-19 pandemic, but at a lower significance level for each index. However, all of the indexes have a reverse ToM effect in the sense that the average ToM returns are negative for all the indexes at the beginning of the pandemic, which is the time when the pandemic did not yet exist in Sweden, but there was news about the disease spreading in other foreign countries (See, Appendix D). The results are in line with the initial assumption on the ToM effect during the time of crisis, which is similar to the findings of Chia et al. (2006); seasonal market anomalies tend to become less pronounced or even insignificant as volatility increases during a time of crisis. During the part of the Covid-19 pandemic before it reached Sweden, BS, the uncertainty about what effect the disease might cause undoubtedly leads investors to engage in risk-reducing behavior, causing the stock market to fall; consistent with Ortmann's (2020) findings. This in turn causes increased volatility in the market and thus results in a total disappearance of the ToM effect during this period. In a time of no existing Covid-19 pandemic, the ToM effect is significant at the 1 percent level for the mid cap and small cap indexes; as well as significant at the 10 percent level for the all cap index. During the Covid-period BS, there is no significant ToM effect for the all cap indexes whereas, for the mid cap and small cap indexes, there is a significant ToM effect at the 10 percent and 5 percent levels, respectively. The expectation beforehand was that there would be a less pronounced, weaker ToM effect during the Covid-19 window, mostly due to increased volatility, which is a direct result of the uncertainty regarding the virus. Analysis of the volatility in the daily returns for each index indicates increased volatility during the Covid-19 pandemic for all indexes compared to the period with no pandemic. This supports the conclusion that these results are in line with expectations based on previous studies. The increase in volatility causes the ToM effect to become less significant and it disappears entirely when observing the entire Swedish stock market.

The ToM-coefficients during the BS window are less than zero, which indicates a decrease in the average return that is attributable to the ToM effect, for the indexes where the effect is still significant. According to the authors, this degree of decrease across all indexes implies that not only retail investors were taken aback by the increased uncertainty, but that this applies to institutional investors as well. Since institutional investors tend to be attracted to large cap companies and retail investors to small cap companies, this level of change in significance for all indexes must be due to all different kinds of investors being affected by and reacting to the pandemic. This type of pandemic has not occurred in modern times; therefore, it is not improbable that the investors start to engage in a risk-reducing behavior as news of the pandemic unravels. Not knowing how to act to maximize profits, or rather minimize losses, contributes to the increased market volatility, making the ToM effect all but disappear in the Swedish stock market. In short, the risk-averse behavior of investors may add to the risk and thus cause increased volatility. Intuitively, this could in turn cause the ToM effect to become insignificant.

The results for the Before Vaccinations (BV) period show that the average of the daily returns around the ToM is significantly higher than in the rest of the month for both the small and the mid cap indexes. This apparent change in the daily returns around the ToM between the BS and BV periods relates, in the authors' opinions, to increased investor confidence from the increase in knowledge regarding the Covid-19 virus. As the world-designed strategies to combat the virus and the nature of the disease became more known, investors felt confident enough to return to the market. This is especially true in the Swedish market since Sweden implemented minimal restrictions during the pandemic which makes the Swedish market attractive to investors. Moreover, the fact that the ToM effect is only significant for the small- and mid cap indexes during this period, suggests that retail investors are more likely to have entered, or re-entered, the stock market at this point. This is because retail investors favor smaller stocks that show characteristics similar to gambling.

The results in the After Vaccinations (AV) period are similar to the Before Vaccinations (BV) period. The all cap and large cap indexes show insignificant ToM patterns, meanwhile, the small cap and mid cap indexes have significantly higher returns around the ToM compared to the rest of the month. Here one would expect to find a higher significance level for the all cap index since starting to vaccinate people should contribute to calming down the market and restoring investor confidence to the levels present in a period of non-existing pandemics. According to the authors of this paper, this can have many explanations: perhaps people were not calmed by the prospect of vaccination since there still was a lack of information regarding the virus and the effectiveness of the vaccine. Perhaps investors anticipated a prolonged pandemic with possible lock-down restrictions. It is also conceivable that this crisis has caused a permanent weakening in the ToM effect. There is a lot of room for speculation on this subject, and therefore there is a need for further research in the field of changes in the calendar anomalies during a time of crisis.

As earlier mentioned, institutional investors are more prone to invest in the larger companies and individual investors prefer to invest in the smaller companies (Barber and Odean, 2000). Further, according to Baker et al. (2020), the retail investors' behavior has changed during the time of the Covid-19 pandemic as a reaction to the limited knowledge of investment and financial decision making leading the stock market to be highly volatile (See, Chapter 2.2.3). For this reason, the change in the ToM effect in the all cap index during the time of the pandemic is most likely a combination of the effects in different indexes during the time of the pandemic.

Finally, the existence of a calendar anomaly that is persistent over time is quite significant from investors' point of view. The efficient market hypothesis stipulates that, for markets to be efficient, any rational investor will act upon mispricing in the market, leading to the disappearance of any opportunities for abnormal profits (Fama, 1970). Hence, the persistence of the ToM effect in the stock market appears to violate the Efficient Market Hypothesis. Since it would surely disappear if investors were aware of it and could profit from its existence. Consequently, further research on this effect is necessary to give insights regarding the existence and persistence of this anomaly, but also regarding potential trading strategies allowing investors to take advantage of this calendar effect.

6.0 Conclusion

6.1 Conclusion of the Study

The purpose of this study is to empirically test if the turn-of-the-month effect is present in the Swedish stock market in general, as well as during the Covid-19 pandemic. This is conducted by gathering daily price data for four indexes representing different sizes of Swedish companies: small cap, mid cap, large cap, and all cap. Daily returns are then regressed on dummy variables for the trading days for different windows around the turn of the month to find whether these windows are significant enough to explain the returns. The study finds evidence of a statistically significant ToM effect for all indexes except for the large cap index. For the mid cap and all cap indexes, the effect is significant when including the four last trading days of the month and the first trading day of the next month as the ToM window. For the small cap index, there is a significant ToM effect for the four last trading days of the month and the first two trading days of the next month. Hence, the ToM effect is statistically significant for the Swedish stock market as a whole but insignificant for the large cap index. The ToM windows are different from those found in other studies internationally since it is an earlier window. Most studies find that only the last trading day is significant as well as the first two to four trading days of the next month. The difference in the ToM window found by this study and those of other studies is most likely due to standardized payments, which is the salaries payments earlier in the month compared to other countries previously studied, which also is suggested in previous studies regarding the ToM effect. During the first part of the Covid-19 pandemic, when the news of the disease spreads quickly but there are no identified cases in Sweden, the ToM effect disappears completely. The increased volatility originating from the uncertainty about the situation causes investors to behave irrationally and increases volatility in the market, reducing or even eliminating the ToM effect. After the first confirmed cases in

Sweden, but before vaccinations started, this study finds a significant ToM effect for the small cap and mid cap indexes, but not for the large cap or the all cap indexes. This suggests that retail investors are the first to return to the stock market since they tend to favor small-and medium sized company stocks. The final period of the data studied, after vaccinations are accessible to the citizens of Sweden, shows similar results compared to the before vaccination period. The ToM effect is significant for the small- and mid cap indexes, but not for the large- and all cap indexes. This is surprising since one would expect the vaccination to have a positive effect on investor behavior and thus show a significant ToM effect in the stock market as the market conditions go back to their standards before the time of the pandemic.

6.2 Knowledge Contribution

The most important knowledge contribution is that prior research has investigated the ToM effect in Sweden, but without any success in finding a significant result. This study has contributed to new research by investigating an earlier ToM window, which resulted in evidence of an existing ToM effect in the Swedish stock market for all indexes but the large cap index. Previous studies have analyzed investor behavior during crises, but this study adds new knowledge in combining investor behavior during the Covid-19 pandemic, and whether the ToM effect is affected, but still significant. The results indicate that the ToM effect is significant in the small- and mid cap indexes both during the beginning of the pandemic and after vaccinations. However, the outcome is different regarding the all cap index, where the ToM effect is no longer significant. The fact that the relationship between the Swedish stock market when there is no Covid-19 and the market reaction to its announcement reflect different results in the ToM effect shows that investor behavior changes and that investors act differently during unusual circumstances. These results strengthen the findings by Chia et al. (2006), that seasonal patterns that are present before a crisis change and are no longer significant when the increased volatility is considered.

6.3 Suggestions for Future Research

Since no other studies have focused on this market, this is the first study to find the ToM effect in the Swedish stock market. Future research should be done to further solidify these results and further prove that the effect is present. Since the relevant ToM window in this study is different from what other studies have found in other markets, the way forward would be to further examine different windows to find if other ToM windows are significant in other markets. Furthermore, this study indicates that there normally exists a ToM effect on the Swedish stock market but that this effect seems to disappear during the first months of the Covid-19 pandemic, only to again be present for small and mid cap companies during the latter part of the period of the Covid-19 pandemic studied. Moreover, research should be done to determine if the ToM effect has fundamentally changed due to factors relating to the pandemic and determine what those factors might be and if the changes are permanent. It is also possible that the change in investor behavior has altered the relevant ToM window during the pandemic, but that the effect persists for different windows. More research should therefore examine different ToM windows during the pandemic. The research can also be further expanded to conclude whether this weakening of the ToM effect also occurs during previous global crises, such as the financial crisis. Finally, since the study indicates that there is evidence of heteroscedasticity in the data, which violates the OLS regression assumptions, further study is required into the effect of increased volatility in times of crisis and how this relates to the ToM effect.

7.0 Limitations of Research

This research is limited to the Swedish stock market, with a limitation to the indexes: OMXSCAPGI, OMXS30GI, OMXSSCGI, and OMXSMCGI. The time period used in this study is between 1/4/2010 and 4/22/2022. This time frame is representative of the period before Covid-19, the outbreak of the virus, as well as before and after vaccinations. This time window is mainly chosen because it captures how the market is affected, showing a result of a period of no pandemic, and during the pandemic before and after vaccinations regarding the ToM effect. It is noteworthy that this study is limited to the available data until the 22nd of April 2022. The virus is still ongoing, which means that the ToM effect can be further analyzed when the pandemic is over. However, the authors of this thesis consider the data to represent reliable results as vaccinations prevent the spread of the virus, indicating that the pandemic is leaning towards its end. Although, there is a risk of the sample being non-representative as the future is unknown and unpredictable in knowing when Covid-19 will end and how these results will be reflected. Another limitation is the strength of further examination of the market due to this thesis deadline and the limitation of the size of the content. Finally, the regression models used to identify the ToM effect for the entire period of the sample, for the impact of the ToY effect, and to investigate the ToM effect during the time of pandemic are simple models; This thesis is within the scope of all knowledge the authors of the paper gathered during the time of their studies at a Bachelor level.

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Appendices

Appendix A

The tables included in this appendix are the estimated parameters from Eq. (1) for each of the ToM windows tested for each index, separately.

Table 1 – Estimated Parameters for each index for the [-1: +4] ToM window

Standard errors are presented below each coefficient in parentheses.

Obs.: Number of daily returns (reinvested dividends included) from 1/4/2010 to 4/22/2022.

Index	Obs.	Intercept: $\hat{\alpha}_i$	ToM: $\hat{\beta}_{i,1}$	R^2
OMXSCAPGI	3,089	0.00063***	-0.00032	0.0001
		(0.00024)	(0.00049)	
OMXS30GI	3,089	0.00064***	-0.00072	0.0007
		(0.00025)	(0.00051)	
OMXSMCGI	3,089	0.00048**	0.00094**	0.0015
		(0.00021)	(0.00045)	
OMXSSCGI	3,089	0.00052***	0.00090**	0.0016
		(0.00020)	(0.00041)	

*/ **/ *** Significant at 0.10/ 0.05/0.01 level.

Table 2 – Estimated Parameters for each index for the [-5: +2] ToM window

Standard errors are presented below each coefficient in parentheses.

Obs.: Number of daily returns (reinvested dividends included) from 1/4/2010 to 4/22/2022.

Index	Obs.	Intercept: $\hat{\alpha}_i$	ToM: $\hat{\beta}_{i,1}$	R^2
OMXSCAPGI	3,089	0.00041	0.00043	0.0003
		(0.00026)	(0.00043)	
OMXS30GI	3,089	0.00046	0.00003	0.0000
		(0.00026)	(0.00046)	
OMXSMCGI	3,089	0.00022	0.00146***	0.0043
		(0.00024)	(0.00039)	
OMXSSCGI	3,089	0.00028	0.00135***	0.0045
		(0.00022)	(0.00035)	

*/ **/ *** Significant at 0.10/ 0.05/0.01 level.

Appendix B

The tables included in this appendix are the estimated parameters from Eq. (1) for each of the ToM windows tested for each index, separately.

Table 3 – Estimated Parameters for each index for the [-4: +1] ToM window

Standard errors are presented below each coefficient in parentheses.

Obs.: Number of daily returns (reinvested dividends included) from 1/4/2010 to 4/22/2022.

Index	Obs.	Intercept: $\hat{\alpha}_i$	ToM: $\hat{\beta}_{i,1}$	R^2
OMXSCAPGI	3,089	0.00033	0.00092*	0.0012
		(0.00024)	(0.00048)	
OMXS30GI	3,089	0.00035	0.00051	0.0003
		(0.00025)	(0.00051)	
OMXSMCGI	3,089	0.00020	0.00215***	0.0076
		(0.00022)	(0.00044)	
OMXSSCGI	3,089	0.00036*	0.00155***	0.0048
		(0.00020)	(0.00039)	

*/ **/ *** Significant at 0.10/ 0.05/0.01 level.

Table 4 – Estimated Parameters for each index for the [-4: +2] ToM window

Standard errors are presented below each coefficient in parentheses.

Obs.: Number of daily returns (reinvested dividends included) from 1/4/2010 to 4/22/2022.

Index	Obs.	Intercept: $\hat{\alpha}_i$	ToM: $\hat{\beta}_{i,1}$	R^2
OMXSCAPGI	3,089	0.00041*	0.00048	0.0004
		(0.00025)	(0.00045)	
OMXS30GI	3,089	0.00047*	0.00000	0.0000
		(0.00026)	(0.00048)	
OMXSMCGI	3,089	0.00024	0.00166***	0.0051
		(0.00023)	(0.00040)	
OMXSSCGI	3,089	0.00030	0.00152***	0.0052
		(0.00021)	(0.00036)	

*/ **/ *** Significant at 0.10/ 0.05/0.01 level.

Appendix C

The table included in this appendix are the estimated parameters from Eq. (2) for each of the ToM windows tested for each index, separately.

Table 5 – Estimated Parameters of the ToM window, controlling the ToY effect

Standard errors are presented below each coefficient in parentheses.

ToM window of [-4: +1] is used for all indexes except for OMXSSCGI, where the window is [-4: +2].

Index	Obs.	Intercept: $\hat{\alpha}_i$	ToM: $\hat{\beta}_{i,1}$	ToM · ToY: $\hat{\beta}_2$	R^2
OMXSCAPGI	3,089	0.00033	0.00086*	0.00122	0.0012
		(0.00024)	(0.00052)	(0.00105)	
OMXS30GI	3,089	0.00035	0.00047	0.00068	0.0003
		(0.00025)	(0.00054)	(0.00110)	
OMXSMCGI	3,089	0.00020	0.00195***	0.00311***	0.008
		(0.00022)	(0.00047)	(0.00096)	
OMXSSCGI	3,089	0.00030	0.00112***	0.00346***	0.0076
		(0.00020)	(0.00041)	(0.00080)	

*/ **/ *** Significant at 0.10/ 0.05/0.01 level.

Note: *The ToM window of [-4: +1] is tested for the large cap index, since both of the mid- and all cap indexes have this ToM window. However, as it is shown in the table, there is still no evidence of any ToM effect in the Swedish large cap index, i.e., in OMXS30GI.*

Appendix D

The table included in this appendix are the estimated parameters from Eq. (3) for each of the ToM windows tested for each index, separately.

Table 6 – Estimated Parameters of the ToM effect, controlling the Covid-19 pandemic

Standard errors are presented below each coefficient in parentheses.

Obs.: Number of daily returns (reinvested dividends included) from 1/4/2010 to 4/22/2022.

Index	Obs.	Intercept: $\hat{\alpha}_i$	ToM: $\hat{\beta}_1$	ToM · BS: $\hat{\beta}_2$	ToM · BV: $\hat{\beta}_3$	ToM · AV: $\hat{\beta}_3$	R^2
OMXSCAPGI	3,089	0.00033	0.000913*	-0.00592	0.00151	0.00150	0.0024
		(0.00024)	(0.00052)	(0.00364)	(0.00169)	(0.00132)	
OMXS30GI	3,089	0.00035	0.00063	-0.00491	0.00077	0.00014	0.001
		(0.00025)	(0.00055)	(0.00379)	(0.00176)	(0.00138)	
OMXSMCGI	3,089	0.00020	0.00189***	-0.00627*	0.00451***	0.00379***	0.0112
		(0.00021)	(0.00048)	(0.00330)	(0.00154)	(0.00120)	
OMXSSCGI	3,089	0.00030	0.00126***	-0.00549**	0.00431***	0.00269***	0.0095
		(0.00020)	(0.00041)	(0.00275)	(0.00127)	(0.00101)	

*/ **/ *** Significant at 0.10/ 0.05/0.01 level.

Note: *The ToM window of [-4: +1] is tested for the large cap index ,similar to the in the Appendix C . However, there is still no evidence of any ToM effect in the OMXS30GI index.*

Appendix E

Table 7 – Volatility of daily returns in the period of no Covid-19

Index	Volatility of returns (standard deviation)
OMXSSCGI (small cap)	0.007975508
OMXSMCGI (mid cap)	0.009111675
OMXS30GI (large cap)	0.011355255
OMXSCAPGI (all cap)	0.010664858

Table 8 – Volatility of daily returns during the Before Sweden window

Index	Volatility of returns (standard deviation)
OMXSSCGI (small cap)	0.013190610
OMXSMCGI (mid cap)	0.013018760
OMXS30GI (large cap)	0.013361201
OMXSCAPGI (all cap)	0.013338183

Table 9 – Volatility of daily returns during the before vaccinations window

Index	Volatility of returns (standard deviation)
OMXSSCGI (small cap)	0.017148977
OMXSMCGI (mid cap)	0.018029108
OMXS30GI (large cap)	0.018745983
OMXSCAPGI (all cap)	0.018393969

Table 10 – Volatility of daily returns during the after vaccinations window

Index	Volatility of returns (standard deviation)
OMXSSCGI (small cap)	0.012439198
OMXSMCGI (mid cap)	0.012977637
OMXS30GI (large cap)	0.010947495
OMXSCAPGI (all cap)	0.011661638

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